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TABLE 11

DESCRIPTION OF INJECTION ZONE

1. Source: Induction Electric Log, Ed Katz & Hillcrest Oil Co., Alonzo Taylor - No. 1, Duval County, Texas.

2. Location: Approximately 7,350 feet east of proposed URI injection well.

| DESCRIPTION | DEPTH FT. | THICKNESS FT. |
|---|---|---|
| Overlying Strata | 3,455 - 3,575 | 120 |
| Injection Interval (Proposed) | 3,575 - 4,975 | 1,400 |
| Underlying Strata | 4,975 - 5,319 | 344 |

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TABLE 12

INJECTION ZONE CHARACTERISTICS

Source: TDWR well data forms or permits

| Description | | Well No. WDW 70 | WDW 153 | WDW 168 |
|---|---|---|---|---|
| 1.0 | General Reference | | | |
| | Operator | Chemical Waste Management | CCPC | Everest Mineral |
| | Formation | Miocene | Jackson | Wilcox |
| | Approximate Interval, Feet | 3470-4700 | 7130-7800 | 5610-6500 |
| 2.0 | Characteristics | | | |
| 2.1 | Air Permeability, md | 1890 | 1700 to 2700 | N/A |
| | Liquid (Brine) Permeability*, md | 1000 | 250 to 500<br>500 | 125 |
| 2.2 | Porosity Range, % | 23-30 | N/A | 5-33 |
| | Typical | 30 | 30 | 25 |
| 2.3 | Bottom Hole Data | | | |
| | Temp., F. | 135 | 150 | 150 |
| | @ Depth, ft. | N/A | N/A | N/A |
| | Pressure, psi | 1400 | N/A | N/A |
| | @ Depth, ft. | 3470 | N/A | N/A |
| | Gradient psi/ft | 0.4 | 0.43 | 0.46 |
| | Fracture Gradient, psi/f | 0.68 | 0.70 | 0.7 |

*Typically a value used in pressure build-up calculations reported in the permit.

## 8.4. Bottom Hole Pressure

The static formation pressure reported in the "Well Data Report" for well WDW-250 (completed in the Yegua) is 1770 psig at a depth of 4377 feet. This corresponds to a hydrostatic gradient ft. 4044 psi/ft. Therefore, .4044 psi/ft will be assumed for this study area.

## 8.5. Bottom-Hole Temperature

The bottom hole temperature for WDW-250 (completed in the Yegua) was 169 degrees Fahrenheit at 4390 ft. This corresponds to a 1.8 degree/100 ft. gradient using 90 degrees as the surface temperature. Assuming this gradient at the proposed Vasquez project, the bottom hole temperature at the top of the Yegua (3575 feet) would be 155 degrees Fahrenheit.

## 8.6. Fracture Gradient

Fracture gradients depend on site-specific characteristics and well conditions. According to the equation developed by Hubbert and Willis (1957), pressures required to fracture increase with the injection history of the well. Thus, maximum allowable wellhead pressures set by initial fracture gradients are conservative.

Using Eaton's correlations and equations, which are discussed in more detail in Chapter 7.1, a fracture gradient of .6959 psi/ft has been estimated for this area and depth.

## 8.7. Formation Water Analysis

The analysis of the formation water collected from URI's WDW-250 in Duval County is shown in Table 14. This well was completed in the same zone (upper Yegua) as the well proposed in this application and should be comparable. The TDS solids of 83,000 ppm seen here for WDW-250 is the value used in calculations in this report for BHP increases expected in improperly plugged wells.

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TABLE 13

PERMEABILITIES AND POROSITIES
IN THE YEGUA FORMATION (1)

Duval and Counties Immediately Surrounding

| County | Sand | Permeability (ml) | Porosity (percent) | Field |
|---|---|---|---|---|
| Brooks | | | | |
| Duval | Yegua | 600 | 32.0 | Cole South |
| | B-Sand | 1,500 | 10.0 | Thanksgiving |
| | Dinn | 1,250 | 33.5 | Thanksgiving |
| | Pettus B | 300 | 29.5 | Cox-Haumon B |
| Jim Hogg | Colorado | 639 | 29.1 | Colorado |
| | 3000 Ft | 800 | 28.0 | Colorado |
| | Rosenberg | 100 | 24.0 | Penrose-Howe |
| | Colorado Sd | 117 | 26.6 | Romeo |
| | Pettus 5000 ft | 250 | 25.0 | Well |
| Jim Wells | | | | |
| La Salle | | | | |
| Live Oak | Yegua | 200 | 27.0 | Ramirena Southwest |
| McMullen | Pettus | 229 | 37.5 | Campana South |
| Webb | Yegua F | 508 | 30.7 | Zamet |
| | Yegua C | 1344 | 30.0 | Presa De Oro |
| | F Zone | 550 | 30.7 | Presa De Oro |
| | Yegua F | 611 | 32.4 | Zimet |
| | H Zone | 740 | 28.2 | Presa De Oro |
| | G Zone | 1985 | 32.0 | Presa De Oro |
| | Yegua G | 832 | 28.4 | Zimet |
| Webb | Yegua H | 700 | 29.0 | Zimet |
| | Yegua-Rosenberg | 527 | 32.7 | Gutierrez |
| | Middle-Rosenberg | 592 | 31.0 | Tal Vez |
| | First Pettus-Yegu | 450 | 33.0 | Glenn |
| | Bruni | 420 | 30.1 | De Sapin, SE |
| | Rosenberg C Sd | 178 | 29.5 | Carolina-Tex, West |
| | Bruni Sd | 800 | 30.0 | Dilton |
| | Yegua | 115 | 30.0 | St. Joseph |
| | Yegua-Pettus | 1200 | 28.0 | McLean |

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TABLE 14

FORMATION WATER ANALYSIS

| Well Data Report on: | WDW-250 |
|---|---|
| pH | 7.47 |
| Calcium | 6,280 |
| Magnesium | 535 |
| Sodium (calc.) | 21,400 |
| Carbonate | 0 |
| Bicarbonate | 128 |
| Sulfate | 64 |
| Chloride | 51,920 |
| Total Dissolved Solids (calc.) | 83,113 |
| Hardness (as CaCO3) | - |
| Fe (dissolved) | 15 |
| Barium | 36 |
| Sp. Gr. @ 60 Degrees F. | 1.064 |